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ABSTRACT

The original task of this project, the development of a preschool curriculum based on Piagetian theory, was broadened to include the development of a teacher training program supporting the curriculum. During the first year of the project the following has been accomplished: (1) a coded card file of approximately 100 curriculum-specific small-group activities for children involving Piagetian concepts have been produced; (2) a list of approximately 100 conversation topics designed to challenge young children's thinking has been completed; (3) 28 weeks of daily curriculum plans for free play experience for young children in the areas of science, art, music, literature, dramatic play, and small and large manipulative skills have been completed; (4) a teacher training program for teachers who will be working in a Piagetian classroom has been designed and implemented; (5) supplementary materials dealing with methods and techniques implied by Piagetian theory were developed to supplement text materials; (6) a 72-hour intensive workshop for preschool teachers was designed and successfully conducted; (7) a battery of tasks designed to evaluate the developmental changes associated with the Piagetian curriculum was developed and refined; and (8) a procedure to train testers to administer and score the task battery was designed and implemented. (Author/KM)

LOGICAL OPERATIONS INSTRUCTION IN THE PRESCHOOL

INTERIM PROGRESS REPORT - HATCH RESEARCH

PROJECT 142-1769, MARCH, 1973*

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I. Overview

Initially, the major questions to be explored by this research project were: (1) What is the potential role for the preschool setting as an active agent in the process of developmental change; and (2) Does a Piagetian based curriculum offer a better opportunity, than the traditional nursery school, for optimizing the positive cognitive and socio-emotional advances associated with the early childhood period. During the planning phase for the first year of this research study, another question assumed increasing importance, namely; (3) What type of teacher training develops teachers who can teach young children in a way which enhances their cognitive and socio-emotional growth? The overall project staff, was committed to the thesis that a good curriculum must have a sound theoretical basis, or to quote Kurt Lewin, "there is nothing so practical as a good theory." It became obvious to the present curriculum development staff that in order to implement a curriculum based on a specific theory of development the teacher must become thoroughly familiar with the theory and its implications for education. Thus, the initial task, the development of a curriculum based on Piagetian theory, could not be feasibly implemented without the concurrent development of a supportive teacher training program.

Throughout the course of the year, ideas and goals about the curriculum for young children and teacher training were developed and organized into a satisfactory whole.

During the first year of the project the following accomplishments have been implemented:

1. A coded card file of approximately 100 curriculum specific

small-group activities for children, which are designed to enhance the child's development of thinking processes in the areas of classification, seriation, number, space, time, measurement, and representation, has been produced.

2. A list of approximately 100 conversation topics designed to challenge young children's thinking has been completed.
3. Twenty-eight weeks of daily curriculum plans for free play experience for young children in the areas of science, art, music, literature, dramatic play, small manipulative, and large manipulative skills has been completed.
4. A teacher training program for teachers who will be working in a Piagetian classroom has been designed and implemented.
5. Various supplementary materials dealing with the methods and techniques implied by the theory for teaching were developed to supplement text materials.
6. A seventy-two hour intensive workshop for preschool teachers in the community was designed and successfully conducted during June, 1972.
7. A battery of tasks designed to evaluate the developmental changes associated with the Piagetian curriculum was developed and refined.
8. A procedure to train testers to administer and score the task battery was designed and implemented.

II. The Curriculum Basis and Form

The present researchers attempted to (1) develop a general program for young children based on Piaget's theory of development and his views on learning, and (2) to design specific small group activities and conversation topics which would focus directly on the cognitive processes necessary for the preoperational child to move on to the next stage of development.

Piaget recognizes four stages of the development of the human organism, (1) sensory motor stage: 0-2 years; (2) preoperational stage: 2-7 years; (3) concrete operations stage: 7-11 years; and (4) formal operations stage: 11 and up. The children in the present study were age 2-9 and 3-9 in September 1971 which implies that most of them were in the pre-operational stage. The idiosyncrasies of the thought processes of the preoperational child necessarily determined the focus of the curriculum. Characteristically, the preoperational child is learning to use language to represent objects and events. Mental symbols enable him to think about things which are not in his immediate environment. He is often misled, however, by the way things appear at any given moment. He cannot understand that quantity remains the same in spite of perceptual changes. For example, he will say that five pennies in a heap is not the same amount as five pennies in a line.

The child in this stage tends to focus on one variable and has trouble realizing that objects can possess more than one property. He is egocentric, finding it difficult to understand that other people view things differently than he does. He relies on his own immediate perception, ignoring both his own previous perceptions and the varying perceptions of others in different spatio-temporal positions.

Gradually, he begins to take these into account and forms systems for understanding his world and for predicting events.

When the child recognizes what it is that remains constant in the face of perceptual changes, he is able to conserve. In Piagetian theory, the ability to conserve is one prerequisite to the complete development of logical thought.

In addition to these insights into characteristics of the pre school age child and his thinking, Piagetian theory provides the following principles which guided development of the overall curriculum framework:

1. Learning is an active process which involves manipulative and exploratory interaction with the environment in the search for alternative actions and properties applicable to objects. This involves both mental and physical activity.
2. There is an invariant sequence of development (e.g., the major periods of cognitive growth, sensory motor, pre-operational, concrete operational, and formal operations and the within stage sub-sequences associated with various concept domains.) Each individual moves through the sequence at his own pace.
3. Each stage in the development of intelligence is characterized by the presence or absence of specific cognitive operations -- children think about the world very differently than adults. They make different interpretations and draw different conclusions from given events than adults do.
4. Language helps to focus on concepts and to retrieve them. It does not <u>in itself</u> build concepts.

5. Intellectual growth is fostered by social interaction with peers and adults as well as by interaction with the physical environment.
6. Autonomy with cooperation, rather than simple obedience to authority, contributes to the child's intellectual and moral development.

According to Piaget's theory, knowledge is progressively created out of adaptive actions (the reciprocal invariant processes of assimilation and accomodation), and it has the function of facilitating the organism's greater adaptation to the environment. Using the framework provided by Piagetian Theory, teachers can evaluate the child's current level of intellectual development -- how he thinks, how he interprets his world at the moment -- and can provide appropriate experiences to enhance his mental growth. This mental growth can be fostered by: 1) making demands on his present modes of thought; 2) providing situations wherein he can test out his own systems of thought and by 3) providing a wide variety of experiences to extend the applicability of his thought patterns.

To help the child relate intellectually to his environment, the Piagetian based preschool curriculum that was developed focused on four content areas: logico-mathematical knowledge, infralogical knowledge, knowledge of the physical environment, knowledge of the social environment. The first content area logic-mathematical knowledge, concerns the relationships between objects. These relationships include:

1) Classification -- recognizing likenesses and differences and learning to sort objects on a consistent criterion.
2) Seriation -- arranging objects in a series according to dimensions on which they differ and understanding the

relationships of objects in the series.

3) Number -- a combination of classification and seriation processes involving an understanding of one to one correspondence, conservation of number, measurement, cardinality, and ordinality.

The second content area, the understanding of space and time, requires the use of abstract, logical operations in dealing with the concrete, physical world of positions, locations, distance, and time sequences. It is often referred to as sub-logical knowledge. These logical and sub-logical concepts tend to be abstract and require a system of thought reinvented in each child's thinking.

The third focus of the Piagetian curriculum involves knowledge which can be discovered through repeated encounters with the natural environment. This is called physical knowledge. The laws of gravity, the laws of causality, and the properties of materials can be learned only through close contact and repeated experience with real objects.

The fourth area, social knowledge, consists of information received through feedback from people in the child's environment. It involves the cultural uses of language, and a knowledge of social expectations and conventions. In this area particular emphasis is placedon helping the child become less egocentric so that he can function empathetically and appropriately with peers and adults.

Implementation -- 1971-72

To involve the children in the processes of classification, seriation, number, space, time, measurement, and representation, continual use was made of spontaneous natural situations with a variety of equipment and materials. Everything in the environment was seen as a resource for

knowledge. The teacher's main task was to be continually aware of the theoretical implications of the children's actions and interpretations of events in order to ask the open ended types of questions which would allow the children to develop their thinking and reasoning capabilities, in short, to create and use on-the-spot situations for learning - spontaneous curriculum development.

While the curriculum required that the teachers continuously ask open ended questions, the theoretical framework maintains that there are no "right" or "wrong" answers to questions asked. Rather, there are alternatives. S. Papert, (as cited in Kamii and Peper, 1969) one of Piaget's colleagues, stated, "the child because of his egocentric view of the world always answers correctly the question he asks himself." If teachers are to learn about a child's processes of thinking and his stage of development, they must encourage him to give the answer he views as correct. If his answer is absurd to an adult viewpoint, situations can be created in which he can explore and discover the answer from various alternatives, that is, from objects and events which do not permit the same conclusions. The child is therefore constructing his own knowledge and confident of his own views. In developing the curriculum a primary concern was that the children be actively critical in distinguishing that which is proven from that which is not. Emphasis was placed on developing the child's creativity, flexibility and inventiveness. The inquisitive approach to the environment which the curriculum attempts to foster is reminiscent of the "scientific method" which is often memorized by students in seventh grade science courses.

A large portion of the overall curriculum was developed as a part of daily classroom programming in the areas of small manipulative activities, art, music, science, large manipulative activities, dramatic play and large group activities, and children's literature experiences. In planning these activities it was the teacher's responsibility to be aware of the possibilities for specific cognitive learnings (in terms of the theoretical curriculum framework) inherent in each activity. Teachers were prepared to pursue different avenues of learning as they were indicated by the actions of individual children. The same materials were often used for a number of activities which focused on different processes. For example, the same beads would be used for activities demonstrating seriation, number, and measurement. Thus, there were activities focusing on one process which used a wide variety of materials as well as activities which focused on different cognitive processes and used the same materials. This method is purported to be more productive in developing cognitive processes than limiting activities to different materials for different purposes, (cf., Pinard and Laurendeau, 1969; Burke, 1971). Most of these activities were planned by the student teachers as part of their student teaching experience. Daily small group activities and juice time conversation topics also focused on the specific cognitive processes of seriation, classification, number, measurement, space, time, and representation. Based on the children's interests and needs, a catalog of 100 small group activities was devised by project personnel. Each activity was written on index cards with general instructions for materials and teacher behaviors. Each activity was also coded according to the mental operation (MO) cf., Lavatelli, 1970; the level of representation (REP) cf., Weikart, 1971, the sensory

experience (SE) and the verall experiences (VE) involved. For small group activities the children were divided into four groups of five children each with one teacher assigned to each group. The groups were arranged so that each contained both older and younger children. The groupings were rearranged occasionally when the staff felt that the groupings were not the most beneficial to the children involved. Four small group activities were chosen each week and were rotated from group to group over the four weekly sessions. This allowed all teachers to evaluate each activity and to offer suggestions for changes. These evaluations were included on the original activity card.

The four juice time conversation topics were also chosen each week and were distributed so that each teacher has an opportunity to use each topic. The children were free at juice time to sit at which ever table they desired, this way the composition of the "juice" groups was different than that of the small groups. With the cognitive processes clearly in mind, teachers had the freedom needed to take advantage of the particular interests of their group at any given time. The conversation topics were evaluated daily and changes were made which were appropriate to the children's responses.

While a detailed language training program was not involved in this curriculum, language development was inherent in the curriculum's emphasis on active involvement with the environment and learning through peer interaction. The attention of the children was continuously directed to various attributes of objects in their environment and to actions which could be performed on these objects. The children were encouraged to work together to discover the physical knowledge inherent in the environment.

Words representing these attributes and actions, such as, hard, soft, low, high, corner, straight, up down, through, next to, squeeze, bend, tear, pour, and chew, became part of their natural vocabulary.

Although the curriculum framework delineates goals and methods in the cognitive domain, socio-emotional growth was a vital concern in its implementation. The rapproachment between cognitive and socio-emotional aspects of development is apparent, since many of the socio-emotional characteristics of the pre-operational child stem from his egocentric view of the world. Social knowledge, consisting of the feedback from people in his environment concerning rules the child can apply to himself, information about other people, andinformation about the social structure of the culture (Kamii, 1971) encourages his departure from an egocentric view of the world. The quality as well as the quantity of peer interactions was stressed through helping the child recognize and respect the feelings and thoughts of other persons. Children's feelings of security and self confidence were enhanced by teachers acceptance of the child's answers to questions. The process of looking for acceptable alternatives to solving problems in the physical environment was also applied to solving personal interaction conflicts. The concern which the children exhibited for each other and the low conflict level became a striking feature of the group.

The coded activities and conversation topics gave the teachers a framework from which to work. However, the teachers were encouraged in all activities to be alert and responsive to extension and/or complete changes in planned activities. This freed both teachers and children

from an imposed curriculum guide which did not fit the situation or the persons involved. Therefore, like the "open education" classrooms, this curriculum framework is simultaneously child-centered and adult-centered (Chittenden and Bussis, 1971).

In creating this type of educational environment, two forces must be considered (1) the effect of each child's uniqueness on his learnings and (2) the unique contributions of each teacher as an individual in influencing the nature and direction of learning. What is done by teacher and child cannot be separated from who does it. This supports the necessity for teachers to be fully cognizant of the theoretical framework, in which they are working in order to use the curriculum as a guide or jumping off point rather than an inflexible model insensitive to the needs of the teacher or the child.

III. The Teacher Training Program - Basis and Form

Due to the necessity for all staff involved with the children to be knowledgeable about the theory on which the curriculum was based, the researchers developed a teacher training program for the student teachers and graduate students involved in the classroom. This training program was developed and refined throughout the year with constant evaluation. It was condensed and used for an intensive 2-week summer workshop for 30 preschool teachers in June, 1972. This program will be offered as a course for student teachers concurrently involved in the Piagetian classrooms during the coming year (1972-73).

This teacher training program involves four areas of knowledge and skill the researchers considered to be necessary for a teacher to be able to function optimally in a Piagetian classroom: (1) Knowledge of Piagetian theory of development; (2) Skills in observing children's behavior and making useful inferences; (3) Knowledge and skill in planning appropriate activities for children; and (4) Interaction skills. It was not possible within the scope of this paper to completely delineate the four areas of knowledge and skill the researchers deemed necessary. The following outline will indicate in a general manner the content of these areas.

I. Knowledge of Piagetian developmental theory

A. Goals

1. Know general principles of development

2. Know sequence of stages

3. Know characteristics of stage related abilities

in processes of classification, seriation, space, time, number, and representation.

4. Know implications of the theory for teaching
   a. Conceptual differences between the terms "theory", "method", and "techniques"
   b. Activities and physical environment
   c. Teacher role behavior
   d. Peer interaction

B. How to attain goals - (see Appendix A)
   1. Reading
   2. Discussion
   3. Films
   4. Lectures and Demonstrations
   5. Workshops

II. Skills in Observation and Inference

A. Goals
   1. Develop habits of hypothesis testing
   2. Distinguish between observation and inference
   3. Focus on those elements of a child's behavior which have relevance to Piagetian theory
   4. Act on basis of accurate observation and inference

B. How to attain goals
   1. Observation assignments in natural setting (See Appendix A)
   2. Discussion of observations

3. Observation "games" - mystery boxes, still life, inference board, "follow directions" drawing

*4. Observation of video tapes - to get conflicting inferences

*5. Observation of films - with and without sound

III. Knowledge and Skills in planning appropriate activities for children.

A. Goals

1. Ability to describe activities and teacher behaviors which would enhance or extend child's development (based on previous observation).

2. Knowledge of possible sequences of activities in accordance with the theory.

3. Ability to foresee learning potentials in any given activity.

4. Spontaneous curriculum implementation -- on-the-spot planning or adjustment and innovation of planned activity to suit needs of the situation and the child. This implies quick analysis of the child's abilities and emotions in terms of theory and appropriate planning.

B. How to attain goals

1. Observation assignments in natural setting

2. Discussion of observations

3. Planning based on observations

*refers to items to be developed in future

4. Curriculum specific equipment centers set up for active participation by student teachers.

*5. Video tape viewing

*6. Films

7. Practical classroom experience using self devised plans and plans of other persons.

IV. Interaction Skills (verbal and non-verbal)

A. Goals

1. Recognize and use open ended, thought-provoking questions and answers.

2. Recognition of personal values, intellectual honesty, and acceptance and encouragement of the same for children.

3. Ability to provide cognitive conflict within limits of "the match" (McV. Hunt, 1963)

4. Provide a verbal model for critical thinking (problem solving approach).

5. Stimulate children to interact with peers through arrangement of environment, materials used, schedule of daily activities, and own behaviors.

6. Be a co-worker with the child in solving problems.

7. Design an environment which stimulates children's maximum involvement with it.

8. Maintain an appropriate social and psychological atmosphere by working with a knowledge of group dynamics.

* refers to items to be developed in future

B. How to attain goals

1. Observation of head teacher
2. Discussion
3. Readings
4. Practical Experiences with a supervisor
*5. Video tapes of self for evaluation
6. Workshops in values, perception and awareness, improvisational drama, and communication skills.

The end product of this teacher training course should be a teacher who can integrate theoretical knowledge, skills of observation and analysis, skills of planning, and interaction techniques to provide meaningful experiences for preschool children to meet their immediate developmental needs and to provide for their future growth and development. (see Appendix B).

IV. The Evaluation - Basis and Form

General Considerations

The evaluation of the Piagetian-based curriculum emphasizes the assessment of developmental changes in the children's thought processes. To a large extent, it will be the individual's reasoning and problem solving abilities which will determine his success in later life. It is apparent to the present researchers that the evaluation must include assessment of the within stage growth of the children, the flexibility and applicability of their thinking, as well as the quantitative, and qualitative changes in children's thinking across

*refers to items to be developed in future

the major developmental stages.

In selecting tasks to be used in evaluating the effectiveness of the experimental curriculum, the project designers were concerned with ethical as well as research questions. Ethically, it was necessary to make each testing situation a comfortable and interesting experience for the child. This included limiting the amount of testing per child, providing tasks and materials which are appealing to young children, and taking time to establish good tester-child rapport.

The specific research concerns centered on a) assessing cognitive abilities using both Piagetian and non-Piagetian measures, b) assessing developmental changes on measures of cognitive style, as indexed by two conceptual tempo tasks, c) assessing children's thought processes through justification for answers given (rather than just accumulating pass/fail data), d) assessing the effects of age, sex, and ability level on task performance, and e) assessing the effects of a Piagetian based curriculum on these aspects of development.

Based on these considerations, the following measures were selected for use in the project:

1. The Peabody Picture Vocabulary Test (PPVT)
2. Spontaneous Measurement Tasks (adapted from Wohlwill, Devoe, and Fusaro, 1971)
3. Seriation Tasks (Burke, 1971)
4. Classification Tasks -- dichotomous sorting (adapted from Kamii, 1971, Kamii and Peper, 1969)
5. Kagan's Matching Familiar Figures (MFF) Test
6. Walk-a-Line/Draw-a-Line (WAL/DAL) test of impulse control (Maccoby, 1965)

Measures

The spontaneous measurement, seriation, and classification measures consisted of batteries of tasks representing major foci of Piaget's theory of cognitive development. The spontaneous measurement tasks were adapted from procedures described in Wholwill, Devoe and Fusaro (1971).. The tasks included in this battery were: a. length comparison; b. distance comparisons via length; c. distance comparisons via units; d. height comparisons via length; and e. area comparisons via units. They were included as indicators of developing conservation abilities.

For analysis of the measurement battery, responses to each task were categorized according to three stages (see Table 1). If the child employed the appropriate measuring process (compared the two pencils, used the stick to measure, etc.) and made a correct response (chose the larger pencil, placed the house in the right position, etc.) his response was categorized as Stage III: measurement. If the child did not give a Stage III response in the first part of the task, but did employ the appropriate measuring process in the second part (when asked what he could do to make sure) his response was categorized as Stage II: Transition. If the child did not give a Stage III or a Stage II response, his response was categorized as Stage I: Pre-measurement.

Insert Table 1 about here

The seriation tasks were based on the protocols and recommended changes discussed by Burke (1971)

These protocols were originally based on the work of Hooper (1972), Coxford (1964), Elkind (1964), and Whiteman (1964). The tasks included in this battery and the scoring used are shown in Table 2.

Insert Table 2 about here

Classification protocols were based on the evaluations developed by Kamii (1971) and Kamii and Peper (1969) for use in the Ypsilanti Preschool Project. The battery involved a free sort task followed by three dichotomous scoring tasks. Scoring includes the number of different dichotomies made and the criteria used.

Because much of the curriculum attempted to help children focus on specific problems and consider various alternatives to these problems, it was thought that reflectivity might increase more in the experimental group than in the control group. Consequently, Kagan's (1963) Matching Familiar Figures Test (MFF) and a reconstruction of Maccoby's (1965) Walk-a-Line/Draw-a-Line Test were also included in the battery.

Each of the twelve items on the MFF test requires a child to choose one out of six figures to match a standard. If a child does not choose the correct figure he is informed of his error and asked to try again. This is continued until he is successful. The first two response times for each of the twelve items are recorded to the nearest half second. An error rate per item is also recorded. Reflectivity and impulsivity in cognitive style are determined by considerations of error rate and of response time.

The Walk-a-Line and Draw-a-Line tests are designed to measure impulse control. Both involve timed trials: one in which the child is simply asked either to draw a line between two points or to walk a specified distance and a second trial in which he is asked to repeat the task as slowly as he can.

Testers

The testers were chosen on the basis of their rapport and ability to work with young children in a relaxed, clinical manner. Out of a group of eight possible testers, three were dropped because of inability to work with children in the desired manner. One dropped out for personal reasons before any testing began. Another dropped out shortly after testing was begun. This left three testers to do the majority of testing throughout the year.

Tester Training

Each tester spent about 40 hours becoming familiar with the testing procedures and attended at least four group meetings to discuss testing requirements, approach, schedules, equipment and specific task procedures. Before beginning project testing, each tester received extensive practice in administering the tests to both children and adults, as well as in recording responses. Whenever possible testers worked with three-year-old children who were not members of either the experimental or control groups. Testers were encouraged to make each child as comfortable as possible. Because of the semi-clinical orientation, care was taken to see that the testers understood the purpose of each test so that they could add or delete words, as appropriate, for each individual child, without invalidating the results of the tests.

In order to become familiar with the children, as well as to help the children become familiar with them, the testers spent at least three mornings in each classroom before administering any tasks. In most cases the testers and children read stories, played games and explored the testing rooms together before testing was begun. As a result, the children appeared to be quite at home in the testing situation and in most cases talked very freely.

During the initial training the testers became familiar with evaluation guidelines suggested by Kamii (1971). Throughout the year the testers met regularly with the testing coordinator.

Procedure

The order of task administration was determined largely by the order of availability. Problems in the development of task protocols and in obtaining task materials made it impossible to have all tests ready simultaneously. Table 3 presents the range in dates for the administration of each set of tasks.

Insert Table 3 about here

The tasks were administered to each child individually. All testing took place in separate rooms designated for this purpose. Testing sessions were designed to last approximately 15 minutes each. The PPVT, Measurement, Classification, MFF, and WAL/DAL tasks were generally given in one session each. To keep to the limited time per session, the Seriation tasks were generally presented in two sessions.

Each tester was trained to administer all tasks and each worked in both classrooms. During testing, tester-child combinations were usually determined by which tester the child was most responsive to on the particular day. Children were not taken to the testing room unless they indicated a readiness to go with a tester. As a rule children greatly enjoyed the sessions and often requested extra turns.

Table 4 presents the distribution of tests administered by the four testers (including the tester who dropped out soon after testing began.) Testers designated as A, B, and C were female; tester D was a male.

Insert Table 4 about here

Experimental Design

The project incorporated a time-lag design (Schaie, 1970 and Baltes and Nesselroade, 1970) involving both pretesting and posttesting of two successive groups of experimental subjects and two control populations (see Table 5). This paper deals with data collected during year I of the project. i.e., results of the pretests administered to children participating in this first year of the study (indicated as Piagetian-1 and Control-1 in Table 1).

Insert Table 5 about here

Subjects

The experimental group consisted of all children enrolled in the University of Wisconsin Early Childhood Study Center during the 71-72 school year. This group was made up of nine boys and ten girls who were randomly selected from among all same sex applicants to the school who were aged 2-9 to 3-11 as of October 1, 1971, and whose parents agreed that the children would participate in the program for two years. A tenth boy had been included in this group but was out of the program during the spring semester -- before testing for the year was completed. Consequently, he was not included in the sample. Most of the children were members of graduate student and professional families.

The control group consisted of ten boys and nine girls ranging in age from 2 years 10 months to 4 years 1 month at the beginning of the school year. These children were enrolled in a private nursery school in Madison, Wisconsin which served mainly professional families.

Although the children were not randomly assigned to groups, they were assumed to come from identical populations because of the large overlap in applications to the two schools.

Table 6 indicates the distribution of children in the two groups by age and sex. The three month age difference between the two groups was significant ($t=2.15$, $df=36$, $p < .05$). The age differences between boys and girls were not significant in either school.

Insert Table 6 about here

V. Preliminary Analyses and Results

Peabody Picture Vocabulary Test

Results of the PPVT (Form A) are presented in Table 7. The mean PPVT verbal IQ scores were 101.48 for the Piagetian group and 114.85 for the control group. This difference was significant ($t=2.52$, $df=36$, $p<.05$). The differences between boy's scores and girls' scores were not significant for either group. The difference in group means indicates that at least on measures of verbal ability the two groups were not as homogeneous as originally anticipated. Because there were some verbal components involved in e h of the other tasks of the battery, this indication of differences in verbal abilities as well as the diff rences in ages between the two groups, must be kept in mind when interpreting results of the other sections.

Insert Table 7 about here

Measurement

Results of the spontaneous measurement tasks are presented in Table 8. In looking at the overall performance of the two groups, children in the Piagetian group gave Stage III responses 14 per cent of the time and children in the control group gave Stage III responses 18 per cent of the time. These percentages indicate that there were no significant differences between the groups ($Z = 1.59$, $p>.05$) in their overall measurement scores. There were also no significant differences between groups on any of the five tasks considered individually.

In differentiating between the five tasks, the results indicated that the distance via length and distance via units tasks were the most difficult. There was no Stage III responses to either of these tasks and there were only 2 Stage II responses to distance via units and 1 to distance via length. Length comparison and area via units appeared to be less difficult. For the length comparison task 4 children gave Stage III responses and 9 gave Stage II responses. For area via units 2 children gave Stage III responses and 12 gave Stage II responses. Height via length proved to be the least difficult task. Twenty-four children responded to this task with Stage III responses and 2 with Stage II responses.

Insert Table 8 about here

Seriation Tasks

Table 9 presents a comparison of the two preschool sample performances on the seriation task. The Control group was superior on total task performance. (t=5.44, df=36, p= $<$.01). Table 9 also indicates the number of students passing each subtask of the seriation task battery. No significant differences were found in performance on sub-tasks 2 through 6. Differences were found between preschools on subtask 7, multiple seriation (x^2=14.52, p= $<$.001) and subtask 1, spontaneous seriation (x^2=2.98, p= $<$.10). Both results favored the Control Group. Analysis of performance on task 1, spontaneous seriation, revealed that the only difference was that more children in the Control

Group viewed the task as a seriation task. Behavioral analysis indicated that the majority of children who performed on this task, in both preschools, made one reversal. Only four children from the group of 19 children were able to make a complete series. These performances indicated that they were not viewing the series as a whole but were dealing with a few elements at a time. This seemed to be consistent with performances on task 2, absolute comparison, task 3, relative comparison, task 4, successive comparison, and task 5, additive seriation tasks within the seriation test battery. On the absolute and relative comparison tasks, both groups achieved a high degree of success. It was when they encountered the need to coordinate two relationships that they failed. Within the relative comparison task there is an implicit order of difficulty. First, the child is required to establish which is the smallest of three blocks; then he is asked to point out the largest of three blocks. His final question is the one that deals with two relationships: "Do you see a block here that is bigger than one block but smaller than another one?" It is this question which only 13% of the entire group of children were successful in answering. A passing score was given when two of the three questions were answered correctly. When required to seriate the group of blocks in order between the biggest and the littlest to make steps, 36% of children were able to seriate five or more blocks, which was considered a passing score; 50% seriated four or more. Failure on the additive seriation task was considerably higher. Children seemed to perceive the seriated group of blocks as a whole, even when spaces were left between blocks in the series. When the

examiner demonstrated by placing one block in the series, children did not perceive the task. Only 23% of the entire group were able to complete the task successfully.

Insert Table 9 about here

Although there was not a significant difference found on pass-fail performance on sub-task 6 (serial correspondence) of the seriation task series, a difference occurred within the task. In the serial correspondence task, the child is first required to establish a one to one correspondence between two graduated orders which have been constructed for him. Secondly,he is required to match related elements when one order is compressed, and thirdly, when one order is extended. Examination of this sequence revealed that performances differed on the one to one serial correspondence task. The Control Group was superior when compared to the U.W. Preschool (t=5.44, df=36, $p < .01$). Performance on this task by the Control Group was so exceptional that it merited further examination. Consultation with staff at this traditional preschool revealed that children were exposed to games where matching techniques were involved. Examiners also noted that the Control Group seemed to enjoy doing this task more than some of the others. Examiners' notes were sketchy as to how much trial and error was involved. The question, however, was whether these children completely comprehended operations involved in ordering a series or the equivalence between two distinct orderings. The number of children successful on the one to one correspondence subtest of the serial correspondence task did not

tally with the children who actually were ordering a series. Only six of the nine children at the U.W. Preschool were successful in the prior operation. Differences here were even greater in the Control Group with only eight of the sixteen displaying ability to order a series. Further comparison within this task was done on degree of success with correspondence when overt relationships (extended and compressed) were destroyed. Three children at the U.W. Preschool of the nine who had accomplished one to one correspondence succeeded in accomplishing the two task requirements. Only four Control Group children from the successful sixteen were able to do the correspondence task when the overt perceptual relationship was destroyed. An analysis on pass-fail data was conducted to determine how many children had mastered tasks in the anticipated order of difficulty. Six children passed both task 4, successive comparison, and task 6, serial correspondence. Eleven children were found to have passed task 6 but not task 4. Eight children passed task 4 but did not pass task 6. The method in which the one to one correspondence task was presented with the examiner constructing both orders for the child to match, seemed to be a much easier task for the children. Passing the serial correspondence task was dependent upon the child's doing two of the three tasks correctly. When one to one correspondence was not included in the pass-fail analysis, only three children passed both task 4, successive seriation, and task 6, serial correspondence.

Pass-fail analysis indicated as reported earlier that the Control Group was superior in performance on task 7, multiple seriation task. Four children passed two of the three tasks presented. Pass-fail

analysis of order of difficulty for the seriation test was tabulated. As reported earlier, serial correspondence was out of order. The observed developmental sequence from task 2, absolute comparison, through additive seriation, generally followed Elkind's (1967 previously reported order of difficulty, Task 1, spontaneous seriation, was not included in this analysis as it was not part of the predicted sequential order of difficulty.

Test administrator analyses were carried out between the experimental and control groups on the total seriation task series. No significant differences were found between the groups. Differences were found when t-tests were run separately for each preschool group. Comparisons were made in two parts, task 1 through 5, and tasks 6 through 7, because the same examiner did not always test the same children on both sections (See Table 6 for distribution of testers on seriation tasks). Results indicated that Examiner A's scores were significantly higher than Examiner B's at the U.W. Preschool. She gave tasks 1 through 5 to the majority of children ($t=2.40$, $df=17$, $p<.05$). The majority of tasks 6 through 7 also were given by Examiner A and test results proved to be higher ($t=2.70$, $df=17$, $p=.02$). Examiner B gave the majority of tasks 6 through 7 to the Control Group. Her group tested higher and a significant difference was found ($t=2.32$, $df=17$, $p=.05$). No significant differences were found between examiners on tasks 1 through 5 with the Control Group. As explained in the procedure section, one examiner gave all of the classification tests while two people recorded and scored results. Thus it was not possible to measure examiner differences on the classification tasks.

Classification Task

A pass-fail analysis on classification was conducted on the classification series (See Table 10). All comparisons were non-significant with the exception of trial 2 in which Control Group performance exceeded that of U.W. Preschool ($\underline{x}^2$=6.75, $\underline{df}$=36, $\underline{p} < .01$). The Control group was able to perform more dichotomies than U.W. Preschool group. There was a fair consistency among the population that made dichotomies, however, as there were only three children who were able to shift criteria and make more than one dichotomy. These three children were members of the Control group. The majority of dichotomies were made on the first trial (see Table 11).

Insert Table 10 and 11 about here

Qualitative analysis for classification revealed the following: comparison between groups on verbal justification of dichotomies made showed the Control Group's superiority ($\underline{x}^2$=5.27, $\underline{p} < .02$). Intensive properties selected by children when making dichotomies were tabulated for each trial. Shape was the property selected by the majority of both groups (see Table 12). Color was the second most frequent choice. Of the three children who were able to shift criteria and perform more than one dichotomy, two selected shape for their first sort.

Insert Table 12 about here

Table 11 shows that only 25% of the children who made dichotomies made them in the free trial. Behavior changed for the remaining 75% when presented with two boxes. Behavior was slightly predictive from the way the children grouped objects in the free trial and what they did in following trials. We hypothesized that in the free trial we might find children who were exhibiting behavior described by Inhelder & Piaget as Stage 2, type 1 or 2 (non-exhaustive sort of similar objects) progressing when presented with two boxes to make a dichotomy. These children, we postulated, would be more inclined to make dichotomies than their counterparts who were exhibiting "graphic" sorting behavior. Nine of the 13 children making dichotomies on the first trial were the children who were grouping like objects.

A difference was evident in actions performed on the elements. When performing the various trial tasks, 50% of the Control group children repeated the dichotomy made in free trial in the subsequent trials, even after the examiner demonstrated the meaning of the word "different". The U.W. Preschool group required less demonstration of differences. Only 20% of the group that made second-order dichotomies repeated the initial grouping.

Sex difference analysis

Student t-tests were run on the combined preschool groups to determine if significant sex differences were present (see Table 13). There were no significant differences found on performances on PPVT-IQ scores, seriation task or classification task performances. There was

a significant age advantage in favor of boys (t=3.22, df=36, p .01). Sex differences were evident on seriation task performances and classification task performances among students in U.W. Preschool when analyzed separately. Total mean scores for the seriation task were 13.9 for girls as compared to 11.6 for boys (t=2.02, df=17, p <.10). Total mean scores for the classification task were .60 for girls as compared to .44 for boys, indicating superiority for girls (t=4.02, df=17, p <.01). No sex differences occurred in the Control group. For the general characteristics to various subsamples, see Table 1.

Insert Table 13 about here

Intertask correlations

Correlations between chronological age, PPVT-IQ scores, classification and seriation scores proved non-significant with the exception of PPVT-IQ with seriation (see Table 14). The combined group PPVT-IQ and seriation scores indicated a significant degree of correlation (r=.47, df=36, p= <.05). This correlation continued to be evident when a partial correlation was run for the combined groups, holding age constant (r=+46, df=36, p= <.05).

Insert Table 14 about here

Kagan's Matching Familiar Figures Test

Descriptive data for experimental and Control group performances on the MFF are shown in Table 15. The response times and error rates were compared using t - tests for two independent samples (Hays, 1963). No significant differences between the two groups were found. An analysis for sex differences in response times and error rates showed non-significant results as well.

Insert Table 15 about here

The major purpose in using the MFF was to determine the influence of the impulsivity-reflectivity dimension on problem solving abilities. For this reason MFF data for the experimental and control groups were combined and a median split was used to separate impulsive subjects from reflective ones, (median response time 1, 6.95 sec.; median error rate, 2.5). An impulsive categorization meant that the response time was shorter than the median response time, and that the error rate was higher than the median error rate. In other words, impulsivity was defined as fast responses, high error rate; reflectivity was slow responses, low error rate. Subjects who responded quickly and were correct or who responded slowly and were wrong were dropped from the analysis of this personality dimension. This left an N of 21, 11 impulsive and 10 reflective subjects.

To test the effects of impulsivity or reflectivity on problem solving abilities t - tests for differences in PPVT, classification, and

seriation scores for the two groups were performed. There were no significant effects indicated.

Maccoby's Walk-a-Line and Draw-a-Line Tasks

The WAL/DAL is presumably related to scores of the MFF since it provides a measure of impulse control. Analysis was done first using the average response time and secondly the increase in response time from trial one to trial two. (see Table 16). Differences between the control and experimental groups were not statistically significant No statistical tests were run on the relationship of WAL/DAL scores to the impulsivity-reflexivity measure since the mean WAL/DAL scores were nearly identical for the impulsive and reflexive groups.

Insert Table 16 about here

Correlations between the conceptual tempo and cognitive measures are shown in Table 17. None of these are statistically significant. No strong relationships are indicated and in general the tests of personality variables show little relationship to the cognitive ability tasks.

Insert Table 17 about here

VI. Generalizations concerning the initial years activities

It is obvious that the initial results of the present research, insofar as the experimental versus control group comparisons are concerned, are generally disappointing, In those instances where significant differences were observed, these differences tended to favor the control group children. Some evidence exists, i.e., the significant control group superiority on chronological age and verbal intelligence scores, which indicates that the two target samples were not initially comparable. Thus, subsequent comparison analyses probably should include covariance techniques.

Beyond these considerations there is clear evidence that the present program was indeed functionally effective. Teacher evaluations of the general effectiveness of the Piagetian program were most positive. Somewhat in contrast to the results of the formal evaluations, teachers kept antecdotal observations on the spontaneous actions of the children in the classroom which indicated that children were making progress in terms of the Piagetian operations at issue.

The children's responsiveness to the general teaching framework was encouraging and was also reflected in the positive reactions of parents. Parental support included informal accounts of spontaneous activities in the home as well as general encouragement for extension and elaboration of the project into kindergarten and first grade programs.

It should also be emphasized that a major aspect of our endeavors concerned the integral teacher training program which of course, can only be indirectly evaluated through an assessment of the target children's criterial task performance changes. The overall teacher training effort

and the singularily successful summer workshop offer striking evidence for the inherent relevance of a Piagetian based Early Childhood Education Curriculum Framework for teachers.

It is worth reiterating that the present project is a three year longitudinal study; therefore, the final judgments regarding the program effectiveness requires the essential long term repeated measurement comparisons. For example, cursory inspection of the second years assessment data indicates notable superiority for the experimental children's scores on the far transfer conservation tasks and multiple seriation and classification measures. The subsequent longitudinal comparisons will include time-lag correlational methods, long range transfer effects, and provision for the consideration of potential negative side effects, etc.

Certain important changes regarding the instructional program and the associated evaluation procedures have been carried out during the second year of operation. As Table 5 indicates the second year involves continuation of the original experimental and control groups and the addition of a second group of 3 to 4 year old children in both the experimental and control program. The curriculum development and teacher training will continue as previously described for Year I.

Changes in evaluation procedures include certain additions and deletions in the task battery, defining different methods of scoring certain tasks, and making minor terminology changes in the test protocols. The general developmental level of the children indicated that additions to the Piagetian battery of tasks were needed. In the

classification battery a class inclusion task (Brainerd, 1973) and a cross-classification matrix task (McKay, Fraser, Ross, 1970) were added. A transitivity of length task (Brainerd, 1973) and a double seriation matrix task (McKay, Fraser, and Ross, 1970) were added to the seriation battery. In addition, three conservation tasks, quantity, number, length, and surface area, were added so that far transfer effects could be evaluated. The general scoring procedures for the Piagetian measures of measurement, seriation and classification will be elaborated so that a child's stage of development can be assessed in addition to the dichotomous pass-fail data.

In the non-Piagetian battery certain changes were decided upon. Since the analysis of the results indicated no significant correlations between children's scores on the Walk-a-Line/Draw-a-Line task or the Kagan Matching Familiar Figures task and the scores on the Piagetian tasks, the former tasks were dropped from the battery. The Raven Colored Progressive Matrices Test was added to the battery of non-Piagetian measures as another general standardized measure of intelligence.

Instruments which evaluate the teacher training program effectiveness through observation, video taping, and changes in attitude-value systems will also be designed and validated. This should include evaluation of the student teacher experiences and evaluation after the student has graduated and is involved in his own program.

In order for a third year of assessment to be made on the original group of children and for further expansion of the curriculum framework and teacher training, a Piagetian kindergarten program will be planned for the Early Childhood Study Center for the 1973-74 academic year. The parents of the original group of children are very interested in this idea and view it as being most beneficial for their children. This would involve the hiring of an additional head teacher and development of an additional year of the curriculum framework.

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Table 1

Stage Categorizations of Responses to the Measurement Tasks

		Section of Task		
Stage	Title	Process	Choice	Probe
III	Measurement	Measures	Correct	
II	Transition	Measures	Incorrect	Measures
		Does not measure or	Correct	Measures
		Does not measure or	Incorrect	Measures
I	Pre-Measurement	Measures	Incorrect	Does not measure
		Does not measure or	Correct	
		Does not measure or	Incorrect	

Table 2

Seriation Task Battery: Order of Presentation and Scoring

Task	Points	No. of Points Required to Pass Task
Session I		
1. Spontaneous seriation	0 - 2	1 to 2
2. Absolute comparison	0 - 2	2
3. Relative comparison	0 - 4	2 to 4
4. Successive comparison	0 - 7	5 to 7
5. Additive seriation	0 - 3	2 to 3
Session II		
6. Total serial correspondence	0 - 3	2 to 3
A. One to one correspondence	0 - 5) 11 total	) 5 = 1
B. Extended array	0 - 3) points for	) 2 to 3 = 1
C. Compressed array	0 - 3) sequence	) 2 to 3 = 1
7. Multiple seriation	0 - 3	2 to 3

Analysis was based upon total points each individual received. Pass-fail analysis also was conducted using the preceding criteria for passing or failing.

Table 3

Descriptive Summary Tables for Complete Test Battery Administered Year I, '71-'72

Test	Theoretical Range	Average Administration Time	Dates of Administration	Actual Range	Actual Mean	Subjective Impression
Peabody (Form A)	0 - 150	15 min.	P_1 11/22/71-11/13/71 (12/14/71, 2/3/72)	65 - 131	102.5	OK
			C_1 12/11/71-1/17/72	92 - 133	113.1	
Spontaneous Measurement	III measures II transition I no concept	8-10 min.	P_1 11/29/71-2/8/71	I - II_I	Does not apply	OK--enjoyable
			C_1 1/6/72-1/18/72	I - III	Does not apply	
Seriation	0 - 35	20 min.	P_1 12/1/71-12/16/71 (3/16/72, 2/10/72)	6 - 24	12.8	too long multiple seriation especially bad
			C_1 1/11/72-1/27/72	12 - 24	17.9	
Classification	1 - 3 dichotomies	15 min.	P_1 2/10/72-3/7/72	0 - 1	.52	fine needs to be extended to class inclusion
			C_1 2/9/72-3/13/72	0 - 3	.64	
Kagan MFF	Response Time[1] (R_1) 0-∞ sec. error rate (e) 0 - 6	15 min.	P_1 4/11/72-5/3/72	R_1 2.6 -25.7 sec. e 1.58- 3.25	R_1 10.28 e 2.59	Bad--too hard, frustrating lots of quick guessing to get task over
			C_1 4/11/72-4/20/72	R_1 2.6 -18.7(71.3) e 1.5 - 3.08	R_1 11.96 e 2.3	
WAL - DAL	WAL 0 - ∞ DAL 0 - ∞	10 min.	P_1 3/20/72-4/13/72	WAL .75- 3.91 DAL .92- 4.44	2.12 2.79	fun--easy but doesn't tell as much
			C_1 3/24/72-4/13/72	WAL .67- 2.28 DAL .5 - 6.82	1.72 2.67	

Table 4

Distribution of Tests Administered by the Four Testers

Test	School	Testers			
		A	B	C*	D**
Peabody	P_1	15	1		4
	C_1	7	1	6	5
	T	22	2	6	9
Spontaneous Measurement	P_1	12	8		
	C_1	8	10		
	T	20	18		
Seriation	P_1 Tasks 1-4	12	8		
	Tasks 4-6	10	11		
	C_1 Tasks 1-4	8	11		
	T Tasks 5-6	7/37	12/42		
Classification	P_1		19		
	C_1		19		
	T		38		
Kagen	P_1		10		10
	C_1		19		
	T		29		10
WAL-DAL	P_1		15		5
	C_1		19		
	T		34		5

* Tester dropped after testing began
** D is only male tester

Table 5

Projected Experimental Design

Preschool Project
1972-73

Testing Schedule

Group (Time of Intake)	Time Fall 1971	Spring 1972	Fall 1972	Spring 1973	Fall 1973	Spring 1974
P-1 (Fall, 1971) C-1	PPVT Measurement Classification Seriation Kagan WAL/DAL		Raven	PPVT Raven Measurement Classification Seriation Conservation		
P-2 (Fall, 1972) C-2			PPVT Raven Measurement Classification Seriation Conservation			PPVT Raven Measurement Classification Seriation Conservation
P-3 (Fall, 1973) C-3					PPVT Raven Measurement Classification Seriation Conservation	PPVT Raven Measurement Classification Seriation Conservation

Table 6

Description of Experimental and Control Groups

by Age and Sex

	Treatment Group					
	Piagetian			Control		
	Boys	Girls	Total	Boys	Girls	Total
Mean Age (in Months)	40.67	38.80	39.69	44.3	41.0	42.74
Range	35-47	36-43	35-47	37-49	34-48	34-49
S.D.	4.50	2.34	3.56	4.29	5.52	5.06
N	9	10	19	10	9	19

Table 7

Peabody Picture Vocabulary Test Verbal I.Q. Scores, Means, Ranges, and Standard Deviations for the Various Subsamples.

	Treatment Group					
	Piagetian			Control		
	Boys	Girls	Total	Boys	Girls	Total
Mean	96.45	106	101.48	116.4	113.12	114.85
Range	56-117	65-126	56-126	92-133	93-129	92-133
S.D.	18.19	21.17	19.88	12.99	11.02	11.88
N	9	10	19	10	9	19

Table 8

Distribution of Measurement Scores as a Function of Task and Treatment Group

		Task																	
		Length Comparison			Distance via Length			Distance via Units			Height via Length			Area via Units			Total		
Group		P	C	Co	P	C	Co	P	C	Co	P	C	Co	P	C	Co	P	C	Co
STAGE	III: Measurement	3	1	4	0	0	0	0	0	0	10	14	24	0	2	2	13	17	30
	II: Transition	4	5	9	1	0	1	2	0	2	1	1	2	8	4	12	16	10	26
	I: Pre-Measurement	12	13	25	18	19	37	17	19	36	8	4	12	11	13	24	66	68	134
Total N		19	19	38	19	19	38	19	19	38	19	19	38	19	19	38	95	95	190

Table 9

Seriation Task--Pass-Fail Comparison by Sub-Task

	P_1	C_1	χ^2 (df=1)
Task 1--Spontaneous seriation			
Mean score	.3158	.8947	
S.D.	.1757	.4648	
No. children passing	6	13	2.98, p<.10
Task 2--Absolute comparison			
Mean score	1.7895	2.000	
S.D.	.4626		
No. children passing	16	19	2.29, p<.2
Task 3--Relative comparison			
Mean score	2.000	2.3158	
S.D.	.67	.5126	
No. children passing	17	19	.075, NS
Task 4--Successive comparison			
Mean score	3.5263	4.1053	
S.D.	1.1387	.9232	
No. children passing	6	8	.658, NS
Task 5--Serial correspondence			
Mean score	.7895	.7895	
S.D.	.4734	.5142	
No. children passing	5	3	.904, NS
Task 6--Serial correspondence			
Mean	5.6842	7.000	
S.D.	1.5831	.7723	
No. children passing	7	10	.111, NS
Task 7--Multiple seriation			
Mean score	.2105	.8421	
S.D.	.2424	.4223	
No. children passing	0	4	14.52, p<.00)
Total score			
Mean	14.315	17.947	
S.D.	2.207	1.891	

Table 10

Classification Task--Pass-Fail Comparison by Trial

		P_1	C_1	χ^2
Free Trial:	Mean	.1579	.2105	
	S.D.	.2563	.3207	
	No. passing	3	4	.301, NS
Trial I:	Mean	.3158	.3684	
	S.D.	.1757	.1303	
	No. passing	6	7	.162, NS
Trial II:	Mean	.0526	.2632	
	S.D.	.2054	.2142	
	No. passing	1	5	6.75, $p<.01$
Trial III:	Mean		.1053	
	S.D.		.2489	
	No. passing	0	2	1.36, NS
Total Score:	Mean	.5263	.9474	
	S.D.	.0264	.7318	

Table 11

Number and Percentage of Subjects Passing

Each Classification Trial

Classification	Number	Percentage
Free trial	7	25%
First trial	13	46.5%
Second Trial	6	22%
Third Trial	2	.07%
Total	28	

Table 12

Intensive Properties Chosen on Successful Classification Trials

	Shape	Color	Size	Total
Free Sort Trial				
U.W. Preschool	2 66.5%	0	1 33.5%	3
Control Group	3 75%	1 25%	0	4
Total	5	1	1	7
Trial I				
U.W. Preschool	2 33.5%	3 50%	1 16.5%	6
Control Group	3 43%	2 28.5%	2 28.5%	7
Total	5	5		13
Trial II				
U.W. Preschool	1 100%	0	0	1
Control Group	3 60%	2 40%	0	5
Total	4	2	0	6
Trial III				
U.W. Preschool	0	0	0	
Control Group	0	0	2	2
Total	0	0	2	4
Total Shape	14 50%	Color 8 28.5%	Size 6 21.5%	28

Table 13

Sex Differences of Chronological Age and Peabody Picture Vocabulary Test and Classification and Seriation Scores for Individual and Combined Groups

Combined Group					
Measure	Girls		Boys		t-test
	M	S.D.	M	S.D.	
Age	42.10	2.56	44.73	2.46	3.22**
PPVT-I.Q.	110.3	9.54	106.	10.8	1.32
Seriation	15.52	2.67	15.31	3.51	.20
Classification	.7368	.34	.73	.47	0
Control Group					
Measure	Girls		Boys		t-test
	M	S.D.	M	S.D.	
Age	44.2	2.20	46.90	1.36	2.89**
PPVT-I.Q.	113.11	6.26	113.9	7.74	.16
Seriation	17.33	1.93	18.6	1.60	.813
Classification	.88	.46	.40	.51	.49
U.W. Preschool					
Measure	Girls		Boys		t-test
	M	S.D.	M	S.D.	
Age	40.2	1.14	42.33	2.00	2.89**
PPVT-I.Q.	107.9	10.9	97.2	10.49	.43
Seriation	13.9	1.84	11.66	2.90	2.02*
Classification	.60	.10	.44	.05	4.02***

* p<.10
** p<.05
*** p<.005

Table 14

Correlations Between Chronological Age and P.P.V.T. I.Q. Scores and Classification and Seriation Total Scores

	U.W. Preschool (df = 17)	Control Group (df = 17)	Combined Group (df = 36)
Classification and Age	r = .31	r = .09	r = .25
Classification and I.Q.	r = .13	r = .10	r = .16
Classification and Seriation	r = .18	r = .26	r = .32
Seriation and Age	r = .07	r = .19	r = .20
Seriation and I.Q.	r = .46*	r = .15	r = .47*

* $p<.05$

Table 15

Response Times and Error Rate on the MFF for Experimental and Control Groups: Means, Medians, and Standard Deviations

Preschool Group	N	Error rate			Response Time 1		Response Time 2		Average of Response Times 1 and 2		
		$\bar{X}$	S.D.	Med.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	Med.
P_1	18	2.59		2.625	10.28	4.36	4.5	5.4	8.17	4.36	8.2
C_1	17	2.3		2.415	11.96	15.4	4.3	6.9	8.4	12.03	6.9
Combined	35	2.44	.53	2.5	11.45	11.65	4.26	6.4	7.86	9.0	6.95

Table 16

Descriptive Data for 2 Methods of Scoring

the WAL and DAL Measures

Type of Scoring	Test	P_1 (N=20)		C_1 (N=19)	
		$\bar{X}$	S.D.	$\bar{X}$	S.D.
Average time for first and second trials (in seconds)	WAL	8.40	4.02	7.60	5.17
	DAL	7.92	3.98	7.51	4.5
Average increase from time 1 to time 2 (in seconds)	WAL	2.12	.96	1.72	1.12
	DAL	2.79	2.08	2.67	1.68

Table 17

Correlations Between Conceptual Tempo Measures and

Cognitive Measures for Experimental and Control Groups

Measures Compared	P_1	C_1	Combined Groups
MFF (R_1) - MFF (R_2)	.107 (N=17)	.350 (N=16)	
MFF (R_1) - PPVT	-.408 (N=17)	.226 (N=17)	
MFF (R_1) - Seriation	-.190 (N=17)	-.102 (N=17)	-.086 (N=34)
MFF (R_1) - Classification	-.111 (N=17)	-.301 (N=17)	-.248 (N=34)
MFF (e) - PPVT		-.108 (N=18)	-.329 (N=35)
MFF (e) - Seriation	.022 (N=18)	-.274 (N=17)	-.248 (N=35)
MFF (e) - Classification	-.306 (N=18)	-.169 (N=17)	-.309 (N=35)
*WAL - DAL	-.299 (N=20)	-.068 (N=19)	-.171 (N=39)

None of these correlations are statistically significant

* Correlation is done using the increase in response time from trial 1 to trial 2.

SCHOOL OF FAMILY RESOURCES AND CONSUMER SCIENCES

APPENDIX A

472-564 - Section 3

Week 1 Lecture - Observation and Inferences
Piagetian Theory - Introduction - general principles
Brief description of children

Handouts- Theory, Method, Technique
Observation
Age characteristics
3's
4's

Week 2 Lecture - Preoperational Child - characteristics of thought, behavior, emotions, physical development

Handouts- Guidance Principles (N)
Guide for students working with children

Reading Assignment #1 (for week 2)
Ginsburg and Opper - Chapters 1 and 3
Kamii - #8 Sketch

Observation Assignment #1 (do week 2)
list one characteristic of each teacher and child

afternoon - note differences in ways children return to school
morning - note differences in children's reactions to separation from mother and mothers reactions

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Week 3 Lecture - Infancy - sensori-motor development film.

Handouts- Approaches in Discipline

Reading Assignment #2 (for week 3)
Ginsburg and Opper, Chapter 2
Kamii - #10 Framework

Observation Assignment #2 (do week 3)
1. Write one illustration of an A-C interaction putting observation in one column and inferences in another.
2. Identify six instances of non-verbal forms of communication which you see between teacher and child.
3. Communication by children of developmental needs - emotional, cognitive, physical (one each)

Week 4 Lecture - Concrete Operations 5-11
Film - Conservation
Choose children to study

Handouts- Logical Operations

Reading Assignment #3 (for week 4)
Ginsburg and Opper, Chapter 4
Kamii - #9 Pedagogical Implications - differences with other theories

Observation Assignment #1 (do week 4)

1. Describe in detail 3 different children's reactions to the same sensory experience or materials (i.e. art)
   What potentials for sensory learning were present in this activity?
   What did the teacher's role tell you about her goals for the activity?

Week 5 Lecture - Nature of childs thought, education implications, and teacher role.
Classification
Film

Handouts- Analyzing children's responses to material
Blocks - potentials for learning - classification and seriation part

Reading Assignment #4 (for week 5)
Kamii #11 Classification
Sigel - Development of Classification Skills in Young Children

Observation Assignment #4 (do week 5)
Pick a teacher and list his or her techniques for as many of the following as possible.

1. establishing rapport
2. setting limits
3. transitions
4. getting attention
5. asking questions
6. clarifying concepts
7. stimulating thought
8. finding out what children think

Week 6 Lecture - Nature of child - Seriation and number

Handouts- Refer to Blocks handout

Reading Assignment #5 (for week 6)
Kamii - #6, Derived Curriculum
Review Chapter 4, Ginsburg and Opper
Kamii - #1, Number

Observation Assignment #5 (do week 6)
Touring classification and seriation city
Observe case study child in all aspects of development

Week 7 Lecture - Space and Time, cause and effect, orientation of self

Handouts- Consult - Blocks handout
General Semantics
"Praise Reappraised"

Reading Assignment #6 (for week 7)
Kamii #7, Implications
Review #6 pg. 8-10
#10 pg. 8 and 9
Stendler Lavatelli pg. 117-127

Observation Assignment #6 (do week 7)
Analyzing children's responses to material
Touring number neighborhood

Week 8 Lecture - Emotional reactions and cognitive interpretation of events.
How child's behavior is influenced by his understanding of the world.

Handouts- Understanding the Language of Behavior
Uncovering Your Child's Masked Messages

Reading Assignment #7 (for week 8)
"Finding the Clue to Children's Thought Processes" - Sigel and Roeper.

Observation Assignment #7 (do week 8)
1. Look for examples of spatial understanding
   - list use of prepositions both correct and incorrect
   - observe evidences of body awareness
   - look for spatial judgment
   - listen for causality and time statements

Tour Space Center

Week 9 Lecture - Perception and Awareness Workshop
How to work with other adults - staff and parents
Representational levels
Film - A Time to Move

Handouts- Communications (N)

Reading Assignment #8 (for week 9)
Kamii #3 Pedagogical Applications
"Pooh, Piglet and Piaget"

Observation Assignment #8 (do week 9)
1. Observe teachers use of praise
   - how she does it - words
   - what effect it has on child's behavior
   - infer how child and teacher feel about that incident

Week 10 Lecture - Values and Infernces about behavior
Objectivity and scientific method in dealing with behavior
Observation and inferences review and relate
Maslow's Hierarchy of Needs

Handouts- Maslow's Hierarchy of Needs

Reading Assignment #9 (for week 10)
Helping Relationships
Four, poor, non-white, and out of sight
The Rightness of Whiteness

Observation Assignment #9 (do week 10)
1. Choose an activity.
   - list ways 6 children use equipment in representing something which is not present
   - at what level of representation is this child in this situation

Week 11 Lecture - Child Report discussions
Child Reports due before Thanksgiving
Soc-emot., cognitive, physical development in light of theory

Reading Assignment #10 (for week 11)
Kamii, #5 Application of ...

Observation Assignment #10 (do week 11)
Choose an incident significant to you.
1. List your reactions to it.
2. Give and explain at least three underlying reasons for your reactions, i.e. sex, inherent traits, childhood experience, previous experiences.

Choose an episode significant to you.
1. List and discuss ways in which the child's behavior could have been influenced by past events or conditions and how this behavior might effect his future behavior.

Week 12 Group Reports on original Piagetian readings

Morality
Language
Perception
Infancy
Ego centrism
Imagery

Child Reports due before Thanksgiving

Reading Assignment #11 (for week 12)
Prepare for report and discussion of original Piaget readings.

Observation Assignment #11 (do week 12)
Observe children for Child Reports.

Week 13 THANKSGIVING

Week 14 Discussion/reports continued

Week 15 Evaluation

Kamii #3 -- Denis-Prinzhorn, M., Kamii, C. K., and Mounoud, P. "Pedagogical applications of Piaget's theory". People Watching, Vol. 1, May 1971.

Kamii #5 -- Kamii, C. K. "An application of Piaget's theory to the conceptualization of a preschool curriculum." In R. K. Parker (Ed) The Preschool in Action: Exploring Early Childhood Prog ams. Boston: Allyn & Bacon, Inc. (1972), pp. 91-133.

Kamii #6 -- Sonquist, H., Kamii, C. K., and Derman, L. "A Piaget-derived preschool curriculum", in I. J. Athey and D. O. Rubadeau (Eds.) Educational Implications of Piaget's Theory. Waltham, Mass: Ginn-Blaisdell Publishing Co. (1970) pp. 101-113.

Kamii #7 -- Sinclair, H. and Kamii, C. K. "Some implications of Piaget's theory for teaching young children." Paper written for the Ypsilanti Early Education Program, Ypsilanti, Michigan March, 1969.

Kamii #8 -- Kamii, C. K. "A Sketch of the Piaget -derived preschool curriculum developed by the Ypsilanti Early Education Program" Paper written for the Ypsilanti Early Education Program, Ypsilanti, Michigan, Sept. 1970.

Kamii #9 -- Kamii, C. K. "Pedagogical implications of Piaget's theory: differences from other theories and current practices" Paper presented at a conference entitled "Application of Piagetian Theory to Education: An Inquiry beyond the Theory" Rutgers University, July 20-22, 1970.

Kamii #10 --Kamii, C. K., and Radin, N. L. "A framework for a preschool curriculum based on Piaget's theory." In I. J. Athey and D. O. Rubadeau (Eds.) Educational Implications of Piaget's Theory. Waltham, Mass: Ginn-Blaisdell Publishing Co. (1970), pp. 89-100.

Kamii #11 -- Kamii, C. K. and Peper, R. A. "A Piagetian method of evaluating preschool children's development in classification. Paper mimeographed at Ypsilanti (Michigan) Public Schools, July, 1969.

Ginsburg, H. and Opper S. Piaget's Theory of Intellectual Development Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1969.

Roeper, A. and Sigel, I. "Finding the clue to children's thought processes." In I. J. Athey and D. O. Rubadeau (Eds.) Educational Implications of Piaget's Theory. Waltham, Mass: Ginn-Blaisdell Publishing Co. (1970).

Sigel, Irving E. "The development of classificatory skills in young children: a training program" Young Children, Jan. 1971, pp. 170-184.

Singer, D. G. "Piglet, Pooh, and Piaget" Psychology Today, June, 1972, pp. 71-96.

Smilansky, Sara. The Effects of Socio-dramatic Play on Disadvantaged Pre-School Children. New York: John Wiley & Sons, Inc. (1968)

Stendler-Lavatelli, Celia Early Childhood Curriculum -- A Piagetian Program. Boston: American Science and Engineering, Inc. (1970).

APPENDIX B - Sample curriculum plans

Sample Curriculum 1

Group 1 Year 1 Semester II Week 21

Week #7: Head Teaching by Student Teachers

Teachers: Head Teaching - concern yourselves with awareness of the total group, sensitivity to changes in group climate, working as a team.
Be a preventive teacher - think one step ahead of children.
Communicate desired roles of others, feelings about own role and participation of other members of team.
Ask for and give feedback.

Juice Time:

distance comparison -- of children at ends of table, across from each other, etc.

What's smaller - an ant or a cow, a bike or a car, etc.
Size comparison - fingers on a hand
Size - spacial judgment, "Would a _____ fit in your cup?"

Small Groups:

1. Forced seriation - lotto game with size seriation.
2. Classification with cuisinaire rods (size and color)
3. Ordering by size and number -- build steps and put smallest object on smallest step, etc.
4. Broad jumps - marking lengths of jump each time

Ideas -- size relation

Large group - movement:

How could you make yourself short (low); lower, lower, even lower? (tall, taller, even taller)
Make self small (like a little ball)
Make self long (like a snake)
Walk with baby steps, with giant steps

Planning Grid Week # 21 Liza - head teach.
Week of Mar. 13 - 16

Area	Monday	Tuesday	Wednesday	Thursday
Music Opening Experience	turkish music dancing w. scarves	percussion instr. + marching	modern music + dancing	diff kinds of movement to modern dance records
Art	paste parts of body to paper	collage out of egg cartons (3-d materials)	easel painting + geometric shapes to cut + paste	playdough, cookie cutters, rolling pins
Science	float - what floats?	what will or will not mix with water	clocks ← →	
Small Manipulative	tinker toys, lincoln logs, lego blocks + face puzzles	lego blocks, snap blocks, tinker toys, face puzzles	lego blocks, stacking tower, village set	add stacking towers, small colored blocks
Dramatic Play	women's clothing shop	telephone operator	puppets	Men's clothing shop
Books				
Large Manipulative	blocks at different heights for jumping	large trucks with road + signs	balance beams board bleys from A Homes	build train with boxes
Juice	apple juice and graham crackers with butter	popcorn + Hawaiian punch	sesame crackers + grape juice	cranberry juice + sociable crackers
Large Group	Red Riding Hood easel story + bean stalk	Buggy bear goes South with a puppet	Thumbkin, pict. of diff kinds of transportation	The Wheels on the bus creative dramatics
Small Group	see other	sheet →	→	
Outside	Simon says Lotto (if rain)	wagons + balls →	→	walk around home ec. bldg.

MO Seriation by size
Rep 2 dim. (pictures)
SE visual
VE big, bigger, biggest

Materials: size discrim. Lotto game

Activity: regular lotto game rules

MO Classif. by size (+ color)
Rep 3 dim
SE tactual, visual
VE size words

Materials Cuisenaire rods, baskets or boxes for sorting

Activity: Work on size relationships - what rods do you need to make a rod as long as this one
I'll all rods this long in this basket

(3)

MO Seriation with correspondence (ordering by size + number)
Rep 3 dim. models
SE visual, tactual
VE size relation words

Materials: 15 blocks (to build steps), 5 sizes of dolls, 5 sizes of rings

Activity: Tell story about dolls needing to make steps. Have 1 child pick the smallest (or largest) doll, 2nd c. pick smallest one (largest one) that's left, etc. Let smallest doll make 1st step w. 1 block. Next smallest make second step, etc. Order dolls on steps 1st smallest on lowest step etc.; then largest on smallest step, etc. Can use rings to match series with sizes of dolls (could be swimming pools, rooms, etc.

(4)

MO Broad jumps – focus on length (pre decimal – seriat.)
Rep
SE kinesthetic, visual
VE "distance", "far"

Materials: line of tape on floor
stickers with children's names on them (diff. color for each)

Activity: Let children take turns jumping – put stickers where they landed. Before each jump – show child where he landed the time before (also after each). Talk about whether he jumped farther or not

Sample Curriculum 2

Group 1 Year 2 Semester I Week 7

Week 7

Review Piagetian Material 9 especially Family Sketch)

Be alert throughout day for chances to reinforce and follow through with concepts from juice and small group times.

Find "invisible children."

Observation - "Analyzing Children's Responses to Materials" and Number Neighborhood

Morning - Juice

1. more-less (liquid quantity)
2. representation (memory) what did we eat for snack yesterday
3. shape discrimination ("corners")
4. light-heavy

Small Group

1. Focus on attributes - haptic perception with big and little (feeling bag)
2. Space (linear ordering) - beads on a string
3. Classification (resemblance sorting)
4. Number (1-1 correspondence) - tongue depressors for money

Afternoon - Juice

1. Recall mornings activities
2. Plan ahead for activities outside - time
3. Concept of one more - number
4. What other kinds of things could we have for snack

Small Group

1. Sequencing - Tomorrow I am going on a picnic.....
2. Classification - Jobs and workers
3. Number - conservation with provoked correspondence
4. Space - missing pieces

Mon, the 23, TGD. 4:30

Planning Grid
Week of Week 7 Oct 10-13

Area	Monday	Tuesday	Wednesday	Thursday
Large Group	Ella Jenkins Movement + song	Story with puppets	"In the Night Kitchen" "The Happy Moon"	Feelings Don't Be Scared
Art	play dough potato printing Magic markers	Spatter painting use leaves Wire Sculpture	Water color painting wire sculpture	Tie Dying
Science	Replant of Coleus Clean Cages	Spider plant w. roots + compare Celery in colored H_2O	Hamsters care nocturnal animals	Sand Desert for Hamsters
Small Manipulative	Spatial Relationships cards parquetry blocks cubes		picture + word bingo - design	purple
Dramatic Play	Shoe store boxes + bags Shoe Shine shop	Puppet Theatre	Shaving Stuff	Fire Equipment men + women
Books	Animal Books - Poetry + verse - Plants books		/	
Large Manipulative	Large weaving wagon ladder obstacle course multi media	Directional paper some things	What do you guys think it is?	think it is?
Music	Records themselves yellow room	wrist bells tambourines + rhythmic records	Sound appliances cow mastering Sound records	Rhythm band + record it
Juice	Talk to kids about what they used for juice.	Hose on Hill Little Shovels + cans Trucks + Tractors		
Outside	Climbing Bikes Trikes		Skateboards + roller skates	Canoe outside
Closing Experience				

MO - Sequencing + Classify
Rep - Sign
SE - auditory
VE - names of items

Materials -

Activity - "Tomorrow I am going on a picnic and I'm going to take ____"
Each person must repeat all items said before him and add one more.

- Could write them w. marker on easel paper
- Could have pictures of picnic items [redacted]

week 7 4

MO - Rep - Space
Rep - Symbol
SE - visual
VE - names of parts, signs, shapes

Material - chalk board or flannel board, chalk or figures

Activity - Show a draw figure with something missing. Ask ch. what is missing. Then draw or place missing piece in a variety of places asking them if it's right
Do this with several pictures.
Also draw missing part in a variety of sizes + shapes
Have them show you correct size, etc by demonstrating w. hands

- Start with some other v. simple what's missing pictures can, home with dog

week 7 [3]

NO Numbers — conserv. w. provoked corresp.
Rep 3 dim obj.
SE visual
VE more, less, same

Materials 9 cups + saucers (or dolls + doll beds, or other obj. that go together)

Activity: Put obj in 2 rows in 1-1 correspondance — or put down 1 row & ask c to put down just as many!
Ask if there are the same no. in each row
Spread out 1 row + repeat question — if c. says no, take 1 obj. away + place it nearby. Repeat until c. changes answer
Squeeze 1 row + repeat procedure

Try taking 1 obj. away before you squeeze or spread out a row

Week Peter W., Stephen Lewis; Barbara, Erica, John week 7 [2]

NO Classif. — teacher directed (social knowledge)
Rep 2 dim (pictures)
SE visual
VE various names of worker + job

Materials: Pictures of people and their jobs
jobs and clothing worn at those jobs.
room and items generally found in that room

Activity. Teacher gives child a picture and asks him to find the one that goes with it (eg. what picture shows what you wear if you're doing that job)
Ask child to pantomime job, putting on the clothing, showing what you do with an item, etc.

Sample Curriculum 3

Group 2 Year 1 Semester I Week 7

Week 7

Review Piagetian Material 9 especially Kamii Sketch)

Be alert throughout day for chances to reinforce and follow through with concepts from juice and small group times.

Find "invisible children."

Observation - "Analyzing Children's Responses to Materials" and Number Neighborhood

Morning - Juice

1. more-less (liquid quantity)
2. representation (memory) what did we eat for snack yesterday
3. shape discrimination ("corners")
4. light-heavy

Small Group

1. Focus on attributes - haptic perception with big and little (feeling bag)
2. Space (linear ordering) - beads on a string
3. Classification (resemblance sorting)
4. Number (1-1 correspondence) - tongue depressors for money

Afternoon - Juice

1. Recall mornings activities
2. Plan ahead for activities outside - time
3. Concept of one more - number
4. What other kinds of things could we have for snack

Small Group

1. Sequencing - Tomorrow I am going on a picnic.....
2. Classification - Jobs and workers
3. Number - conservation with provoked correspondence
4. Space - missing pieces

Planning Grid
Week of Oct. 9-13 Week #7

A.M.

Area	Monday	Tuesday	Wednesday	Thursday
Large Group	~~Puppets~~ → Songs Linda	Songs sequence of activities (getting ready for school) Pixie	~~Ruth~~ Denise	movement with word + drum accompaniment Ruth
Art	finger painting with white soap suds (tempera paint to sprinkle on) 8 trays	1 easel – gold, red, brown paint at tables sticks, rocks, leaves	sponge painting with clothespins yellow green brown ↔	Black + red paint at 1 easel white playdough with flour + water
Science	Plant pineapple stems + avocado seeds	terrarium (show + explain)	make terrarium	water play — measuring cups and bowls
Small Manipulative	puzzles spatial rel. cards		cookie cutters + paper to draw around them	rubber shapes to trace around
Dramatic Play	shoe store ↔ blue room	shoe shine shop	~~puppets~~ ↔	fire house
Books	rhyming books ↔ seasonal change ↔			
Large Manipulative	obstacle course ↔		platform with planks + blocks ↔	
Music	wash boards + bells + tuning forks	combs with waxed paper	balloons to → maracas make sounds with marching record	
Juice	pineapple avocado water crackers	shakes – from fruit and milk	raisins peanuts in the shell	oranges and orange juice
Outside	hose to make river on hill ↔ sand toys ladders and	teeter totter slides	trikes ↔ 2 wheelers	
Closing Experience		milk weed pods and wind		

wk 1 AM [1] (2)

big - little

NIO pre-classif- seriation
Rep
SE haptic perception of size
VE big, little

Materials – Large bag
Large objects - zebra, doll bed, boat
small " - small Lincoln log, lego block, cube, a tinkertoy

Activity Put large + small objects in a bag. Take out one of each size for children to see + feel. Then ask child to reach in bag and find something big (or little)
Start with 2 objects in bag (1 big + 1 little) – Ask children to find the big or little one
then add additional objects – Demonstrate finding "something big", replace it and show finding "something else" big. Let children do same

wk 7 AM [2] (1)

NIO Space – linear order
Rep
SE: visual, can be tactile or any others
VE - 1st, last, middle, between, next to

Activities: Help children match beads on a string, pictures in a sequence, clothes on a clothesline. Start with 3 objects and add more

Ver. 8-11 Use beads on a string
1. Help c. spread out so they have room to work
2. Shake cups, guess what's inside
3. Discuss strings (length, color, thickness)
Discuss beads (color, size, shape + made of wood, roll or don't roll, etc.)
4. String beads + have c. copy (1 bead at a time)
5. Make whole pattern, set it on floor and have c. copy it
6. Pull string through tube (1st yellow bead goes in 1st, will it come out 1st?)

MO. Classif. – resemblance sorting (matching to teacher's block) color
Rep.
SE color discrimination – visual
VE names of colors

(Tune = "Put your finger in the air.")

Activity: Song Put your red block in the air, in the air etc.
1st teacher holds up object (when children seem able to do it, teacher can make mistakes) Then teacher doesn't set model
Use body parts, shapes, colors, objects (comb, cups, etc.)

Materials: set of varied colored objects for each child

MO Number (1-1 correspondance of actions)
Rep make believe
SE visual, motor
VE "one," 2, 3, etc.

Materials: set of counting sticks or "money" for each child. Tray of objects for them to buy

Activity Let each child decide what he wants to buy
Tell him how much it costs and make the trade
"You give me 1 stick and I give you the toy"
After each child has had several turns or has used up his "money," redistribute "money" and let children try being storekeeper.